ERRATA

Page 101 line 1 *for* Raphanastrum *read* Raphanistrum
" 108 line 17 from below *for* Pastanaca *read* Pastinaca
" 137 line 5 *for* intervenes *read* intervene
" 144 line 1 from below *omit* in the
" 154 line 11, from below after (1906) *add* as synon. of *C. hupehensis*

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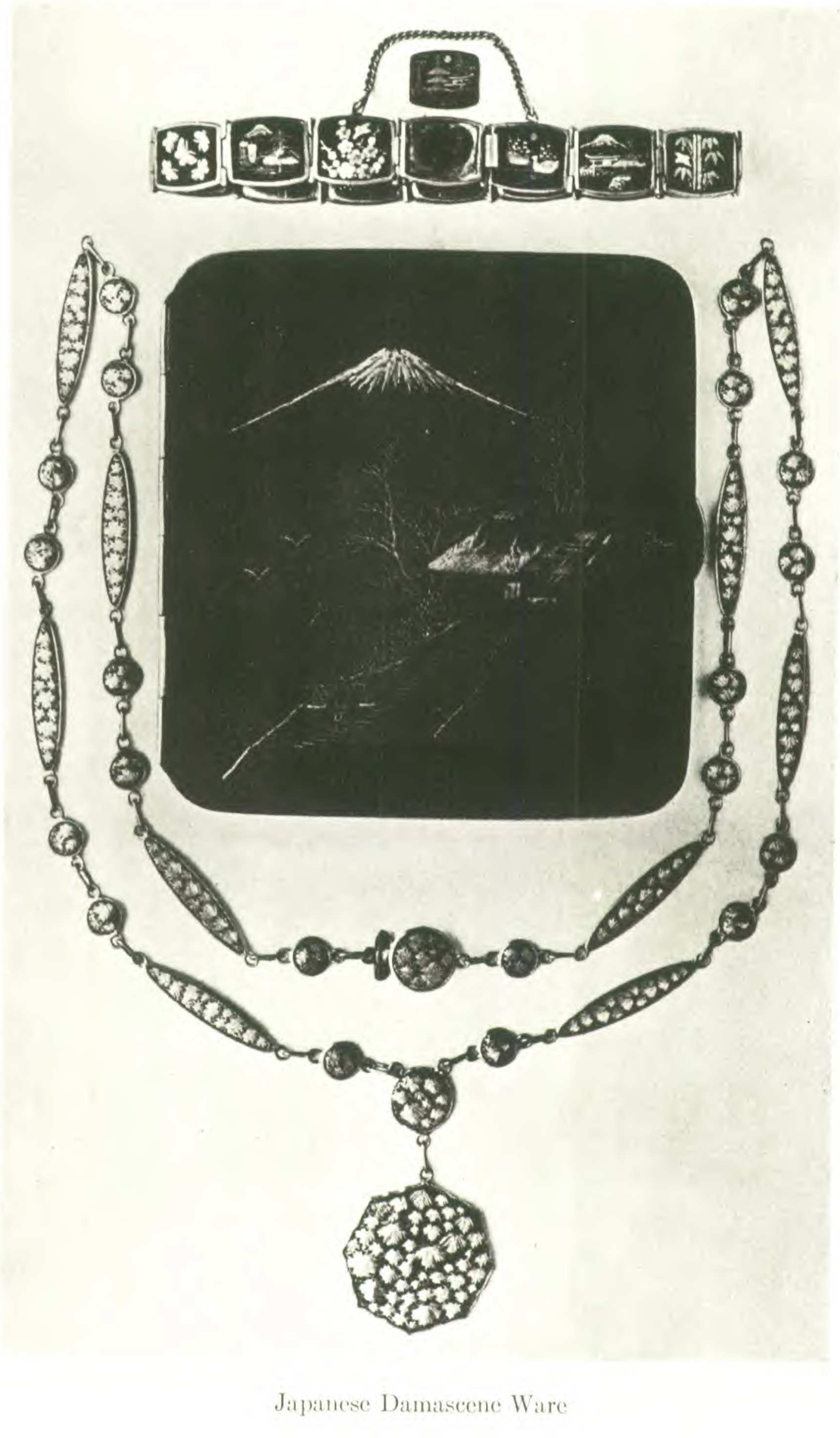

Japanese Damascene Ware

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RHUS VERNICIFLUA AND JAPANESE DAMASCENE WARE

OAKES AMES

Plate 27

IN CHINA AND JAPAN where the resin of *Rhus verniciflua* is used in the manufacture of lacquer ware, Rhus dermatitis or lacquer poisoning, is recognized as an industrial disease. Usually this disease is confined to workmen who gather the fresh resin or apply it, but from time to time, not only in China and Japan, but in countries to which lacquer ware is exported, well marked cases of Rhus poisoning occur among people who handle lacquered articles.

In April 1930 a rather extraordinary outbreak of lacquer poisoning occurred among passengers returning from Japan to the United States on the S. S. Columbus of the North German Lloyd Line. One woman experienced a severe case of poisoning after wearing a necklace of Japanese damascene ware purchased in Kyoto. Her neck, where the necklace had rested, was encircled by the papular eruptions characteristic of Rhus dermatitis. It was supposed that the necklace had been purchased from a salesman whose hands had been in contact with fresh lacquer, but this supposition was rendered doubtful when other women on the steamer exhibited well marked cases of Rhus dermatitis as a result of wearing necklaces and bracelets of damascened metal purchased in Japan.

Japanese damascene ware resembles very closely the product of Damascus from which it takes its name, and appears to be wholly composed of metal, that is, of gold or silver inlaid on oxidized steel. Assuming that the Japanese product is wholly metallic, it is difficult to understand how the symptoms of poisoning were stimulated that occurred among the passengers of the S. S. Columbus. There would be nothing to fear from any polishing substance or protective coating necessitated by the classic methods of manufacture.

Investigations indicated that the damascened articles,—such as necklaces, bracelets, cuff-links, cigarette cases and boxes,—purchased in Japan by the passengers on the S. S. Columbus, differed materially from genuine damascene, not only in the methods of manufacture, but in composition. The black background employed to bring out the delicate designs executed in gold and silver, proved in every case to be non-metallic and to consist of a resinous substance which yielded readily to a cutting instrument.

The common type of modern Japanese damascene ware that one finds in the shops to-day, is made by incising numerous lines on a polished surface of steel and pounding in a design of gold or silver or both, in low relief. Then black lacquer, prepared from the resin of *Rhus verniciflua* is applied and brought up level with the surface of the design. Unless actually disturbed with cutting instruments the lacquer is extraordinarily durable and will withstand drastic solvents without being materially damaged. Even when boiled for a short time with such solvents as carbon tetrachloride, toluene and butyl acetate, specimens of Japanese damascene that are in part composed of lacquer exhibit only slight injury. Indeed, lacquer made from *Rhus verniciflua* is one of the few materials of botanical origin that will come through the ordeal of this treatment and retain its original aspect. It is well known that Japanese lacquer resists the solvent effects of alcohol and is often used in the manufacture of cocktail cups.

Technically the term damascene should be confined to articles made of iron or steel inlaid with more precious metals. Tourists who purchase the supposedly damascened articles carry away the impression that only metals are used. It is true that some of the manufacturers of Japanese damascene admit that lacquer constitutes a part of the design. One of the large manufacturers in Kyoto describes the process as follows: "Lines are cut double hatchway on a polished surface of steel, and gold and silver are pounded down, a design being worked out in this way. Either lacquering or oxidizing process is given next, which is followed by the finishing work of polishing or engraving." The use of lacquer to imitate oxidized steel, while permissible as a form of artistic expression, is indefensible if deception is being practiced and the substitution of black lacquer for oxidized steel is made with fraudulent intentions. There must be a considerable difference in the cost of manufacture between lacquer-damascene and damascene of the original type, and it is evident that the profit is great when what may be termed lacquer-damascene is sold for the same price that would have to be established for true damascene.

When lacquer is comparatively fresh it is still capable of causing the characteristic symptoms of Rhus poisoning and when dry may be toxic to people who are especially susceptible to the poisonous effects of Poison Ivy (*Rhus toxicodendron*) and Poison Dogwood (*Rhus vernix*). If bracelets and necklaces are worn for prolonged periods, symptoms of poisoning will begin to appear, redness of the skin being in evidence in susceptible people, in about two days. Undoubtedly the season of the year will have a direct influence on the degree of toxicity, and if in hot weather lacquer-damascene of comparatively recent origin is worn against the skin by one who is extraordinarily sensitive to Rhus poisoning, well marked symptoms of dermatitis may develop rapidly and cause serious trouble. The necklace which caused the most severe case of Rhus dermatitis on the S. S. Columbus (cf. Pl. 29) is in large part made of gold, the lacquered parts being of comparatively negligible area. Furthermore only the metallic part of the necklace was worn in direct contact with the skin, yet the symptoms of poisoning encircled the neck of the wearer.

SUMMARY

The cases of Rhus dermatitis or lacquer poisoning caused by wearing or handling Japanese damascene are attributable to lacquer, the prepared latex of *Rhus verniciflua* Stokes, dyed black. The Japanese product in which lacquer is used should be called lacquer-damascene to avoid confusion and to warn those who are susceptible to Rhus or lacquer poisoning.

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Harvard University.

EXPLANATION OF PLATE 27

The bracelet at the top of the plate has one of the designs (executed on a metal tablet) removed to show the method of construction. (Bot. Mus. Harvard U. no. 4485.) The cigarette case is lacquered where black is shown. (Bot. Mus. Harvard U. no. 4486.) The necklace is reproduced from the one which caused the first case of Rhus dermatitis on the S. S. Columbus. (Bot. Mus. Harvard U. no. 4463.)

THE ORIGIN AND RELATIONSHIPS OF THE POMOIDEAE

Karl Sax

Plate 28

Cytological studies of the more polymorphic genera of the Rosaceae have shown the probable origin and relationship of many species. The larger genera such as *Rosa*, *Rubus*, and *Prunus* each contain a number of species with the same basic chromosome number, and a large series of polyploids. The Pomoideae on the other hand consists of genera which are usually diploid, with a few tetraploids and triploids.

The basic chromosome number is 7 for the larger genera of the Rosoideae and 8 for the Prunoideae, but is 17 for all of the genera in the Pomoideae. Nebel (1929) and Darlington and Moffett (1930) have suggested that the Pomoideae are aneuploids derived from a 7 chromosome ancestor by chromosome duplication. Nebel suggests that the present *Malus* species are halved pentaploids derived from an ancestor with 35 somatic chromosomes. Darlington and Moffett also believe that the basic chromosome number of *Malus* is 7, but that the present forms are secondary polyploids with a basic number of 7 pairs of chromosomes, of which 4 are represented twice and 3 are represented three times. These authors go even further and suggest that the morphological characteristics of the Pomoideae are due to the establishment of a secondary basic chromosome number. These conclusions are based on the fact that the more important genera of the Rosoideae have 7 chromosomes as the basic number and that in species of *Malus* quadrivalents and sexivalents are found at the first meiotic divisions. Such an unbalanced secondary number of chromosomes must be considered remarkable in view of the fact that all of the species and varieties in the Pomoideae are orthoploid, with chromosome numbers of 17 or multiples of 17.

The present investigation was made in order to obtain chromosome counts of most of the genera of the Pomoideae. In view of the theory that this sub-family originated from a 7 chromosome form, a further survey of chromosome numbers was made in other genera of the Rosaceae. Most of the chromosome counts were obtained from acetocarmine smears of pollen mother cells. Mr. Dermen has made the counts of the *Prunus* species and most of the Spiraeoideae recorded, while Mrs. Sax is responsible for the counts in the *Amelanchier* species. The taxonomic grouping is based on Rehder's Manual (1926).

The chromosome numbers of representative genera are given in the following table. Counts obtained by previous investigators are indicated. In genera with polyploid species only the basic and highest polyploid numbers are given.

CHROMOSOME NUMBERS IN THE ROSACEAE

Sub-family	Genus	Chromosome No.	Native habitat
Spiraeoideae	*Physocarpus*	9	N. Am., Asia
	Spiraea	8 +	N. Am., Asia
	Pentactina	9	Korea
	Sibiraea	9	Eu., Asia
	Exochorda	8	Asia

Pomoideae	*Cotoneaster*	17–34	Eu., Afr., Asia
	Mespilus	17	Eu.
	Crataegus	16–32 L.[1]	
		17–34	N. Am., Eu., Asia
	Sorbus	17	N. Am., Eu., Asia
	Aronia	17	N. Am.
	Photinia	17	Asia
	Eriobotrya	17 M.	Asia
	Chaenomeles	17 K. M.	Asia
	Cydonia	17 R. K.	Asia
	Malus	17–34[2] R. K. N. D.	N. Am., Eu., Asia
	Pyrus	17– [2] R. K.	Eu., Asia
	Amelanchier	17–34	N. Am., Eu., Asia
Rosoideae	*Neviusia*	8	N. Am.
	Rhodotypus	8	Asia
	Rubus	7–28 L. C.	N. Hemisphere
	Potentilla	7–14 Ti. S.	N. Hemisphere
	Rosa	7–28 T. B. H. E.	N. Hemisphere
	Fragaria	7–28 L. I.	Am., Eu.
Prunoideae	*Maddenia*	16	Asia
	Prunus	8–88[2] K. O. D. Me.	N. Hemisphere
	Prinsepia	16	Asia
	Osmaronia	6 K.	N. Am.

[1] L.—Longley, M.—Morinaga, K.—Kobel, R.—Rybin, N.—Nebel, D.—Darlington, T.—Tackholm, B.—Blackburn and Harrison, H.—Hurst, E.—Erlanson, I.—Ichijima, Me.—Meurman, C.—Crane, Ti.—Tischler, S.—Shimotomai.

[2] Triploids also found especially among the cultivated varieties of ***Malus*** and ***Pyrus***.

The chromosome counts in the Spiraeoideae were obtained from the following species:—*Physocarpus monogynus*, *P. intermedius*, *P. stellatus*, and *P. capitatus; Spiraea pubescens* and the hybrid *S. oxyodon; Pentactina rupicola; Sibiraea laevigata;* and *Exochorda Giraldii Wilsonii.*

Most of these genera contain few species and *Pentactina* is monotypic. There are about 80 species of *Spiraea*, however, and a considerable number of species hybrids. This genus undoubtedly contains some polyploid species although exact counts of the higher chromosome numbers could not be obtained. The basic numbers for this sub-family are 8 and 9.

In the Rosoideae chromosome counts were obtained for the following species:—*Neviusia alabamensis, Rhodotypus scandens, Potentilla fruticosa* (7) and *P. tridentata* (14). *Neviusia* and *Rhodotypus* are monotypic genera. *Potentilla* is a large genus with more than 300 species of which only a few are woody. Both the woody and herbaceous species of *Potentilla* have 7 pairs of chromosomes as the basic number (Tischler 1929, Shimotomai 1929) instead of 8 as earlier investigators reported. The haploid chromosome number is 8 for the two monotypic genera, but is 7 for the polymorphic and polyploid genera *Rubus, Rosa, Potentilla* and *Fragaria.*

In the subfamily Prunoideae, chromosome counts have been obtained for *Maddenia hypoxantha*, and *Prinsepia uniflora*. According to Kobel the monotypic genus *Osmaronia* has only six pairs of chromosomes. The large genus *Prunus* has eight chromosomes as the basic number. Chromosome counts of the following species have also been made. Species with eight pairs of chromosomes include *Prunus incana*, *P. avium*, *P. serrulata sachalinensis*, *P. incisa serrata*, *P. subhirtella*, *P. glandulosa*, *P. pennsylvanica*, *P. alleghaniensis*, *P. pumila susquehanae*, *P. angustifolia*, *P. americana*, *P. japonica Nakaii*, *P. orthosepala*, *P. hortulana*, *P. Munsoniana*, *P. maritima*, and *P. lanata*. Two species were found to be tetraploids; *Prunus Padus* and *P. virginiana*. Previous investigators have found diploids, triploids, tetraploids, hexaploids and aneuploids in the genus *Prunus* (Kobel 1927, Okabe 1928, Darlington 1928–30) and in one species Meurman (1929) found about 88 pairs of chromosomes. The two genera *Maddenia* and *Prinsepia* are apparently tetraploids but *Osmaronia* does not seem to have the typical basic number of 8.

CHROMOSOME NUMBERS IN THE POMOIDEAE

All of the genera of the Pomoideae have 17 pairs of chromosomes or polyploids with a basic number of 17. In some genera, especially *Cotoneaster* and *Crataegus*, it was difficult to obtain clear division figures with the acetocarmine technique. In some cases there appeared to be only 16 pairs of chromosomes in *Crataegus* as Longley (1924) has reported. In most genera there is more or less association between the chromosomes at the first meiotic division, as previous investigators have found, so that it is often difficult to determine the exact number of bivalent chromosomes. The following chromosome counts were determined from acetocarmine smears of pollen mother cells.

Cotoneaster moupinensis and *C. salicifolia* are diploids with 17 pairs of chromosomes while *C. horizontalis* is a tetraploid. The 17 bivalent chromosomes of *C. moupinensis* at diakinesis are shown in figure 4. The chromosomes of the tetraploid species are shown in figure 3. Other species were also found to have more than 17 pairs of chromosomes although exact counts were not obtained. It seems probable that a relatively large proportion of the *Cotoneaster* species are polyploids.

Mespilus germanica has 17 pairs of chromosomes and not 16 pairs as reported by Meyer (1915). The meiotic chromosomes at 1 M are shown in figure 2.

Only a few species of *Crataegus* were examined because this genus was thoroughly studied by Longley (1924). Longley reports that 16 is the basic chromosome number in *Crataegus* and he finds numerous triploid and a few tetraploid species. The great variation in morphological characters in this genus is attributed to hybridization between species.

In several species of *Crataegus* the acetocarmine preparation showed only 16 pairs of chromosomes but other species undoubtedly have 17 chromosomes as the basic number. The 16 groups of chromosomes in the hybrid *C. Lavallei* are shown in figure 1. In *C. Deweyana* there are clearly 17 pairs of chromosomes at late diakinesis (figure 8). In this species, as well as most other species in the Pomoideae, there is a tendency for bivalents to be associated in groups of two or even three. At the first metaphase *C. lawrencensis* appears to have 17 or 18 pairs of chromosomes (figure 7), but at the telophase of the division there are about 33 chromosomes at one pole (figure 6) and 32 at the other, with one lagging chromosome still at the metaphase plate. The chromosomes in this pollen mother cell were especially clear. It is possible that *Crataegus* is a transitional genus with both 16 and 17 chromosome forms, and that such species as *C. lawrencensis* with apparently 32 bivalents and 2 univalents could produce segregates with either 16 or 17 chromosomes as the basic number. The association of chromosomes into tetravalents is the result of duplication of the primary basic number of chromosomes.

In the *Sorbus* species there is much less tendency for the bivalents to form a secondary association and exact chromosome counts were easily made. *Sorbus Aucuparia*, *S. americana*, *S. discolor*, *S. alnifolia*, and *S. Aria* are all diploids with 17 pairs of chromosomes. The meiotic chromosomes of *S. aucuparia* and *S. alnifolia* are shown in figures 5 and 12.

The closely related genus *Aronia* also has 17 pairs of chromosomes. Two of the three species were studied and both *A. melanocarpa* and *A. arbutifolia* were found to be diploids (figure 11).

Only one species of *Photinia* was available for study in the Arnold Arboretum. It was found to be diploid with 17 pairs of chromosomes which are shown in figure 10.

The chromosome number of *Eriobotyra* was determined from root tip counts from seedlings grown in the greenhouse. The somatic chromosome number is 34 which is in accord with the count obtained by Morinaga (1929) for the same species, *E. japonica*.

The 17 chromosomes of *Chaenomeles sinensis* are shown in figure 9. This count agrees with the number previously reported by Mor-